

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)	
)	
Unlicensed Use of the 6 GHz Band)	ET Docket No. 18-295
)	
Expanding Flexible Use in Mid-Band)	GN Docket No. 17-183
Spectrum Between 3.7 and 24 GHz)	
)	
To: The Commission)	

COMMENTS OF NOVELDA US, INC

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I. INTRODUCTION

Novelda respectfully submits this response to the FCC (“the Commission”) in the above-mentioned proceeding. Novelda is a developer and supplier of Impulse-Radio Ultra-Wideband (IR-UWB) semiconductor devices and sensor modules designed to operate in the 6 GHz band, and we appreciate the opportunity to provide these comments to the Commission.

II. COMMENTARY

We recognize that this Notice of Proposed Rulemaking (NPRM) in ET Docket 18-295 has been brought forward, in a large part, as a result of Wi-Fi equipment manufacturers seeking more spectrum to offer additional service to their users and grow their business. We want to emphasize the fact that the bands between 3 GHz and 10 GHz are already available for unlicensed usage under FCC PART 15 Subpart C Section 15.250 *Operation of wideband systems within the band 5925-7250 MHz*, and/or under Subpart F – *Ultra-Wideband Operation*, and that there are already many manufactures making and deploying equipment operating under these wideband and ultra-wideband rules that have proven ability to co-exist with sensitive licensed users in the 6 GHz band in a non-harmful way as a result of the imposed restrictions on transmit power.

Novelda is a manufacturer of radar semiconductor devices and OEM-modules designed to be operated in these bands, and which our customers use to design, manufacture, and deploy such equipment. As such then, we are very concerned that these existing and rapidly expanding deployments will be severely disrupted if new higher-powered unlicensed transmitters are allowed to occupy the spectrum that is now being effectively used by UWB and wideband radios for a variety of useful and critical applications. Novelda is currently supplying devices to a variety of applications, with the largest growth within the areas of health / lifestyle, elderly care, building automation / security, and man-machine interfaces where advanced high-precision sensing is utilized to increase quality-of-life and preserve energy.

These and other applications are enabled by UWB radar technology utilizing the currently available bandwidth to enable high spatial resolution and sensitivity even with the very limited allowed transmit level of -41.3 dBm/MHz. Many new products enabled by this technology are currently under development:

- Monitoring of elderly people and infants in a hospital / care unit / home setting
- Monitoring of operators of critical equipment to avoid drowsiness or falling asleep

- Counting and localization of people in buildings or meeting rooms to optimize HVAC and save energy
- Robust detection of presence in office buildings, hotels etc. to increase safety and enable more efficient evacuation in case of fire, earthquakes etc.
- Non-contact monitoring of vital signs
- Presence detection and user identification for consumer electronics user-interfaces
- Fully automated and remote sleep monitoring
- Non-invasive monitoring of cardiovascular diseases
- Non-destructive material inspection

III. DISRUPTIVE TECHNOLOGIES ENABLED BY THE 5.925-7.125 GHz BAND

This band is the main band used by Novelda's semiconductor devices and modules where we have a center frequency of 7.25 GHz and a nominal -10dB bandwidth of up to 1.5 GHz. In general, this band is especially useful since equipment here may operate under the wideband rules of FCC PART 15 Subpart C Section 15.250, allowing outdoor usage on mobile devices (as well as general indoor usage). This band is also well harmonized with European (and several other countries) UWB standards and is therefore the preferred choice for high-volume applications that cannot easily be deployed in other frequency bands nor through use of other radio technologies:

1. Human presence detection: Robust detection of human presence without wearing any tags etc. is a quite complex task where range resolution and location accuracy are important parameters. Range resolution is proportional to signal bandwidth while location accuracy relates to signal-to-noise-ratio (SNR). Currently the required bandwidth is only available globally under the Wideband or UWB-band rules and at higher frequencies (60GHz and beyond). Widespread use in consumer applications with omnidirectional coverage puts strict requirements on cost and energy consumption giving UWB a large advantage due to the lower path-loss and technology requirements compared to 60 GHz and above. The available bandwidth also plays an important role in being able to classify humans relative to other moving objects like fans and curtains etc. Precise and timely classification enables a huge potential for energy savings related to lighting and HVAC compared to existing technology based on passive infrared and acoustic sensors where long shutoff delays (wasting energy) are used to mitigate problems with detecting people sitting still or barely moving. UWB-based sensors detect any living object even when sitting completely still and will respond without delay to any change in the scene.

2. Vital signs detection: Detecting vital signs like respiration and heart rate of humans and animals based on remote sensing relies on the ability to sense extremely small motions on the body surface caused by respiration and the mechanical movement of the heart. Wide bandwidth enables valuable range information while the wavelength of UWB-signals matches perfectly to the magnitude of chest movement caused by respiration and heart motion (movement within one wavelength). The combination of range / location information from a non-intrusive technology combined with vital signs makes UWB technology extremely well suited for home-based care of elderly and disabled people. This is a rapid growing application area enabling people to live longer in their homes with increased quality-of-life compared to staying in an institution. Long-term non-contact, non-intrusive sensing of vital signs may also be used to derive more refined health information for healthy people like sleep quality, fatigue / vigilance, health status etc.
3. Human interaction sensing for consumer and IoT: Integrating human presence detection and vital signs detection as embedded functions in personal devices and in-home devices like TVs, smart-speakers, computers etc. makes it possible to not only adapt the scene and user experience depending on the number of people and location in a room / area, but by detecting respiration, heart-rate and gait signatures non-intrusive identification and personalized scene / device adaption become possible. This is an extremely high-volume and disruptive application where UWB technology is superior due to the low-energy consumption and unit cost combined with use-case performance. The ability to handle and constructively utilize multi-path is also a key benefit of UWB compared to alternative technologies.

V. SUGGESTED LIMITATIONS ON DUTY-CYCLE AND TX POWER LIMIT

Opening up the 5.925-7.125 GHz band, to new unlicensed transmitters with U-NII like power levels should be of concern to the Commission from the point of view of the likely disruption to the unlicensed equipment the Commission has already allowed to operate under FCC PART 15 Subpart C Section 15.250, and/or Subpart F, particularly in light of their application in areas of safety and security whose impairment could have serious consequences. Sharing studies have shown that a duty cycle restriction and transmit power limits are necessary to contain the potential for interference. Based on the duty cycles advanced by the supporters of the RKF study, Novelda proposes that a 0.5% duty cycle limit¹ per access point is enforced by regulation, i.e. written into any new rules. Since this

¹ These duty cycle restrictions could follow the European Low Duty Cycle (LDC) mitigation used for UWB devices, see Annex 2 to ECC Decision (06)04

study and its parameters have been suggested by the proponents, the commission should reasonably infer the 0.5% duty cycle limit is sufficient to support their applications.

Sharing studies have shown the need to limit high power emissions. The limits proposed in the current NPRM does not address this interference potential. By simply adopting the same power levels of the other U-NII bands, the RF pollution that has led to congestion there will spread to the rest of the spectrum as well. Avoiding this will, at a minimum, require that strict transmit power control rules be introduced for both access points and client devices.

Furthermore, Novelda believes that proper limitations on duty-cycle and transmit power level lead to more efficient use of the spectrum and more innovation. There is already plenty of spectrum available for unlicensed broadband services at high power levels, both in the 2.4 and 5 GHz bands, and in the 60 GHz range. We would like to see broadband access systems adopt similar frequency reuse techniques as those that have led to increased spectrum efficiency in cellular systems. We therefore urge the FCC to restrict the e.i.r.p in the 6 GHz band to no more than 0 dBm. Ideally, to avoid this disruption, any new entrants would be constrained to the transmit power **limits** currently allowed by these wideband and ultra-wideband rules. Detect-and-avoid of the deployed devices will be difficult since their maximum transmit level of -41.3 dBm/MHz will in general make them undetectable by typical U-NII radios unless they include specific demodulators for the deployed wideband modulations.

VI. URGENCY

While the coalitions of companies seeking the opening of the aforementioned bands are saying this is an urgent matter, we would ask the Commission to proceed with caution taking due consideration of the current unlicensed users and applications who should be protected. A number of new and unique products only made possible by UWB technology are currently being deployed both for commercial and consumer usage. Allowing for new unlicensed transmitters with U-NII like power levels will be harmful and disruptive for these products.

VII. CONCLUSIONS

With regards to the general suggestions in the NPRM we are worried that the current unlicensed use of the frequency range between 3.1 and 10.6 GHz will be disrupted.

We believe that the 5.925 to 7.125 GHz band should not be opened for new unlicensed use with U-NII transmit power levels because of the likely disruption these new transmitters will cause to existing deployed equipment and systems operating unlicensed under FCC PART 15 Subpart C Section 15.250, and/or under Subpart F. Alternatively, any new unlicensed users allowed should be subject to duty-cycle restrictions of maximum 0.5% and transmit power limitations of 0 dBm. There are a large

number of companies who have invested and are investing billions of dollars in the development of UWB and wideband systems. This industry represents substantial employment and revenue generation, both of which are growing rapidly. The utility of these systems, for unique sensing and precision location-based services often in security and safety critical applications, must be preserved.

Yours respectfully,



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